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1918
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Engineering

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OFFICIAL PROCEEDINGS
Meeting of April, 1918.

Volume XVII.
No. - - - 4

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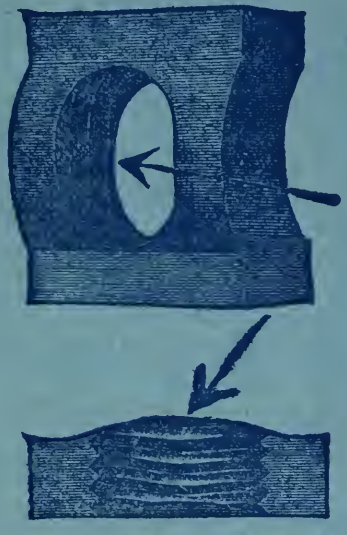

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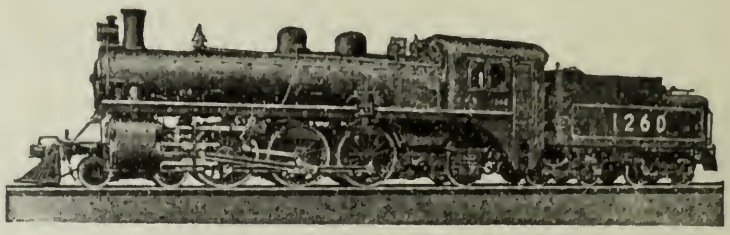

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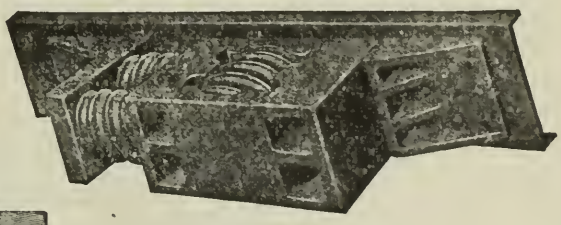

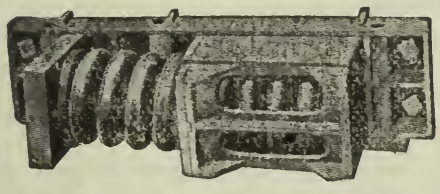

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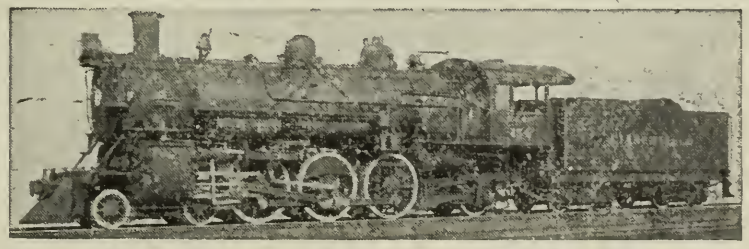

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JAMES POWELL, Secretary, 46 Aberdeen Ave., St. Lambert, near Montreal, P.Q.

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PROCEEDINGS OF THE CANADIAN RAILWAY CLUB.

Windsor Hotel, Montreal,
April 9th, 1918.

Chairman:

Please come to order, gentlemen. I am very glad to announce that we have with us this evening a large number of our friends from across the line, who, I am sure, will take part in the discussion of the paper. We also have three Past Presidents of the Air Brake Association, the present President of the Air Brake Association, and the Vice-President of the Central Railway Club of Buffalo. I will ask that all members sign the attendance cards in the seats, so that a complete record may be obtained of the attendance.

It is not necessary to read the minutes of the previous meeting, as these minutes have been printed and are now being mailed to the members.

The next order of business is the announcement of new members. I will ask the Secretary to read the list of names which I may say have already been passed upon by the Executive Committee.

Secretary:

Mr. President and gentlemen, the following names have been submitted for membership in the Club. These names have been favorably passed on by the Executive Committee and only require your ratification.

NEW MEMBERS.

Clark, H. A., Rly. Rep., Garlock Packing Co., 200 Queen St. North, Hamilton, Ont.

Cookman, R. C., Asst. Foreman, Montreal Locomotive Works, 92 3rd Ave., Maisonneuve.

Gillians, R. H., Storekeeper, Canadian Westinghouse Co., Montreal.

Gillespie, P., Plant Superintendent, Franklin Rly. Supply Co. of Canada, Ltd., Montreal.

Hall, W. B., President, Union Rly. Equipment Co., McCormick Bldg., Chicago, Ill.

Johnson, G., Sales Manager, P. & M. Co., Ltd., 319 Coristine Bldg., Montreal.
Moeller, I., Mechanical Engineer, Eastern Car Co., New Glasgow, N.S.
Wheeler, H. E., Trav. Engineer, Bird-Archer Co. of Canada, 308 Oxford St., London, Ont.

Chairman:
You have heard the names as read by the Secretary. It will be in order to move their adoption.

Mr. W. Spence:
I move their adoption.

Mr. W. C. Hunter:
Seconded.

Chairman:
Moved by Mr. Spence, seconded by Mr. Hunter, that the names as read be accepted.
Carried.

MEMBERS PRESENT.

G. E. Smart
L. H. Albers
J. Atter
J. Bannon
W. L. Barrow
A. M. Barry
P. O. Batzold
P. J. Berube
W. G. Bird
R. D. Black
J. B. Blair
S. Blumenthal
W. A. Booth
G. S. Bowler
F. W. Branscombe
L. Brooks
A. B. Brown
L. Brown
C. E. Buckland
W. E. Buckle
J. Burke
J. Burns
M. E. Casey
E. W. Chaffee
H. A. Clark
W. Clegg
M. T. Coleman
C. H. N. Connell
R. Cookman
A. Crumpton
E. A. Cunningham
B. Davis
W. Davis
J. O. Desjardins
D. Desparois
W. Dockville
A. E. Dupras
J. M. Eakins
E. Eley
W. J. Elliott
F. E. Emsley
W. E. Evans
H. Ewan
J. F. Faber
F. B. Farmer
W. Forrest
G. Fulton
F. J. Gibson
W. K. Gillespie
R. H. Gillians
A. A. Goodchild
P. Gowing
W. H. Graves
H. G. Griffin
W. B. Hall
R. A. Hamaker
R. M. Hannaford
S. P. Harriman
M. J. Hartney, Jr.
J. Hartney
J. Hendry
A. Holden
F. H. Hopkins

W. W. Horwood
J. W. Houston
W. C. Hunter
J. Inglis
E. Jeffries
E. G. Kelly
W. T. Kuhn
L. J. Langan
F. P. Lawrence
S. Lees
G. E. A. Letourneau
R. K. Linagh
E. E. Lloyd
J. M. Macpherson
H. T. Malcolmson
O. W. Meissner
M. Miller
A. E. Mimms
H. Montgomery
L. A. Moreland
C. S. McCarthy
C. T. McCrossen
E. S. McMillan
E. J. McVeigh
W. P. McVey
R. McVicar
D. B. McWilliams
W. A. Newman
F. Nowell
K. F. Nystrom
A. Page
J. E. Palme
H. Pearce
H. Peplar
C. J. Pierce
A. Pope
W. F. Pouphrett
F. A. Purdy
W. Rake
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P. P. Reynolds
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A. S. Robertson, Jr.
E. A. Robinson
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D. Ross
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B. F. Shortley
E. D. Smith
W. Spence
J. M. Spence
W. R. Spencer
T. A. Summerskill
H. P. Swinton
H. Tetlaw
E. Thomas
H. W. Thorp
J. E. Tinkler
C. Tinkler
J. L. Van De Wall
E. R. Viberg
C. H. Weaver
H. Wheatley
J. H. Wheatley
R. B. Williamson
W. H. Winterrowd
F. H. Wyer
G. R. Wyer
Jas. Powell
and others

Chairman:

The next in order is the report from Standing Committees. We have a committee appointed to look after the disposal of the money received at the Smoking Concert, which amounted to about $306.00, less some minor expenses. This committee requested that their report be left over until next meeting, as they desire additional time to look into deserving cases of members who have gone overseas, to see if the families of these members need assistance. We had better comply with their request and allow this matter to remain over until next meeting. Is it with your wish that this be done? All in favor please signify in the usual way.

Carried.

Next is unfinished business. I do not know of any unfinished business that we have left over.

Next is new business. We have no new business before the Club this evening.

Reports of Sub-Committees—I have not heard of any except the report just mentioned.

There is also the matter of unfinished discussion of the

paper given at our last meeting. Possibly some member would like to say something on that paper. I was obliged to leave before the meeting was over, but there may be further discussion.

Before taking up the next item of business I have a sorrowful announcement to make. Mr. Hudson, our Second Vice-President, is unable to be with us to-night by reason of his having just learned of the death of his son over at the front. I think it will be in order for our Secretary to write him a letter of condolence in connection with the Club.

The next order of business is the presentation of the paper of the evening. In this connection I would like to state there must be something in the residence in the great American Northwest that is conducive to the development of strong character, superior judgment, and a great capacity for the handling of details.

We have several splendid examples of this, in the accomplishments of Lord Shaughnessy, the late Sir William Van Horne, the late James J. Hill, and our good friend and fellow club member, Mr. H. H. Vaughan—all of whom are acknowledged as being exceptional leaders in their respective lines.

Additional names of equally prominent and successful men can be mentioned, who at some time in their career resided in the American Northwest, but I have one man particularly in mind, who for years has been the hitching post for transportation men in their repeasted discussions of heavy tonnage, train movements on heavy grades, etc., who is personally known by the majority of railway men from coast to coast, and who is one of the earliest and most trusted lieutenants of the late George Westinghouse.

I refer to Mr. F. B. Farmer, Northwestern Representative of the Westinghouse Air Brake Company, of St. Paul, Minn., the author of the paper of this evening, and who has further honored us by travelling many miles to be present on this occasion. Gentlemen, I have great pleasure in introducing Mr. Farmer, who will now address the meeting.

Mr. F. B. Farmer:

It is pretty hard to embarass an air brake man, but I have to acknowledge feeling embarassed by the kind remarks of your President. We are all prone to err, and as he does not make many mistakes we shall have to excuse him for the error made in introducting me.

"FREIGHT BRAKE MAINTENANCE."

By Mr. F. B. Farmer, Northwestern Representative Westinghouse Air Brake Co., St. Paul, Minn.

Mr. Winterrowd, Chairman of your subject committee, when honoring me with an invitation, transmitted by that able and persuasive air brake man, Mr. A. B. Brown, to present a paper on air brakes, made the excellent suggestion that the exact subject be one that would appeal to practical, operating men. With experience as brakeman, fireman, locomotive engineer, and in air brake work, as instructor and mechanical expert, you will appreciate why I feel more at home when discussing the everyday subjects with practical men, those on and near "the firing line"; hence, that his suggestion appealed to me.

But, as there are many practical subjects, the question was what is the more important now. Our mutual purpose is, above all else, to do our utmost to help win the war that is to free the world from the menace of that would-be dominant militarism, with all this means, as too well illustrated by its terming of a solemn compact as "a scrap of paper" and its perpetration of the unspeakable Belgian horrors. As a critical part toward this end is the safe and expeditious movement of trains; as such movements are absolutely dependent on efficient air brakes; as the major need in this is the freight train; and as I have been one of four air brake men who have, working together, given special attention for several years to freight train handling and brake maintenance, I believe that the subject selected will appeal to you.

My first purpose is to convince that freight brake maintenance is generally unsatisfactory; next to show why; and then to suggest how to improve it. If I err in assuming that your maintenance is similar to ours, please accept my apology and congratulations.

As is generally known, the Westinghouse Air Brake Co. maintains a large, selected and trained organization for the special purpose of co-operating with customers in obtaining good and economical installation, maintenance and operation of brake equipment. Several years ago, while two of us Westinghouse men and two railway air brake experts were giving particular attention to reducing freight train break-in-twos, we became convinced that freight train brakes in interchange service were not being maintained as well as

the needs and the time and money spent on them would warrant, but to effect an improvement the proof and the causes were required.

PROOF OF UNSATISFACTORY CONDITIONS.

The proof of unsatisfactory conditions was finally obtained at a "dead line" division point on a road where to control an increased tonnage safely, and without aid from hand brakes, down a subsequent steep, descending grade required that at this terminal all brakes in each freight train must apply with the ordinary terminal test application of a 20-pound, continuous service reduction from 70 pounds, and that none leak off entirely during the period of inspection.

As this application should produce approximately 50 lbs. in every brake cylinder; as brake pipe leakage causes more to be fed in from the auxiliary reservoirs during the inspection, as the inspection is finished ordinarily in 12 to 14 minutes; as one-inch recession of piston travel means the loss of all effective holding power; as 5 or 6 pounds in a brake cylinder will hold the brake cylinder piston in applied position; as no test of the retaining valves was included; and as no brake was considered ineffective unless entirely off when inspected, it will be appreciated that this test requirement was very moderate, yet, when the rule was first put in force, and although division terminals in advance of this one did more brake cleaning than before, 10 to 12 per cent. of the cars had to be set out for brake repairs.

The even more disturbing feature noted was the short time since a large proportion of these defective brakes had, as indicated, by the stencils, been supposedly put in good condition. This was in 1913. That you may appreciate not only how bad the situation was, but also the great possibilities remaining after two years of special and unusual work done to improve it, as described later, please see table No. 1. It shows, out of the total ineffective brakes set out and repaired at the "dead line" point for July of three years, the number of such bearing system stencils, and the elapsed periods since they had supposedly been put in good order. System-cleaned brakes only were taken because we were seeking to improve the work on this particular road. The foreign-cleaned brakes on it showed a much worse condition. In fact, a check made in October and November, 1917, of freight trains yet uninfluenced by steep grade conditions,

the latter resulting in improved brake maintenance, showed that of 1103 system cars 14.1% had defective brakes, as compared with 25.3% on 659 foreign cars.

TABLE No. 1.

BRAKES CLEANED AT "DEAD LINE" POINT.

System		% SYSTEM WORK RECLEANED IN MONTHS.											
July	Stencils	1	2	3	4	5	6	7	8	9	10	11	12
1913	596	21.3	35.7	44.7	51.9	56.9	63.0						
1914	823	18.9	28.1	36.2	43.0	48.2	52.6	58.4	65.1	76.1	84.9	93.5	96.9
1915	630	8.8	16.1	23.8	30.9	36.3	44.6	47.7	54.1	65.2	75.7	85.4	95.4

In this tabulation the average car months since previous brake cleaning were 6.6 for 1914 and 7.1 for 1915, a gain of 7.5%. But these brakes had not suddenly become inefficient. Hence, with more "dead lines," which would have caught the defective brakes sooner, these averages would have been lower. Even so, note in 1913 that 44.7% of the defective brakes were inefficient three months after cleaning; that this was 23.8% in 1915; and that with but one "dead line" and it operating in one direction only, less than 5% had run over 12 months.

Although a special effort was made in 1914 to improve conditions, and in spite of the encouraging results shown in table No. 1, a gauge test for brake cylinder leakage made at various division terminals in 1915 on 164 freight brakes showed that of 52 tested immediately after cleaning 46.1% leaked down over 5 lbs. in one minute.

The customary method of lubricating had been followed, this including filling the expander space, next to the inside of the packing leather, with the lubricating grease. As this temporarily stops or reduces leakage through a defective packing leather the unfavorable results stated were minimized.

As illustrating this feature, a special gauge test was made of a packing leather that the average cleaner would judge by inspection to be good, but which we had found to be very porous. With a dry surface on the expander side and a lubricated cylinder wall it leaked 38 lbs. from 50 lbs. in one minute. This was reduced to 7 lbs. leakage by filling the expander space with lubricant. After being under pressure of from 50 lbs. down to about 30 lbs. for 90 minutes,

representing not over two or three days' ordinary service, the leakage had increased to 37 lbs. The lubricating grease on the porous portion had been forced through the packing.

Reverting to the gauge tests, 12 brakes just cleaned leaked up over 3 lbs. from 50 lbs. in one minute, due to faults in the triple valves or their gaskets. A limit of 3 lbs. should certainly not be exceeded. From this cause and excessive cylinder leakage 40.6% of these 64 brakes were defective immediately after cleaning. The average leakage was 8.4 lbs.

A gauge test of 76 brakes that, caught at random in 1915, had run from one to three months since cleaned showed the following leakage from 50 lbs. in one minute:

TABLE NO. 2

71.0%	leaked	over	5	lbs.
59.2%	"	"	10	"
40.7%	"	"	15	"
21.0%	"	"	20	"

The 59.2% that leaked over 10 lbs. averaged 22 lbs. or 44% of a full service application.

Regarding the present general condition of freight brakes in interchange service, thorough terminal tests and inspections made personally by the four of us air brake men on freight trains in transit during Oct. and Nov., 1917, covering 51 trains far removed from mountain grade service and 26 others ready for or having recently come down steep, descending grades, indicated a very noticeable improvement in the brakes of the 26 trains, as compared with 1915, but absolutely none in the others. The 51 trains had 2,276 cars, and 14.1% of these cars had inefficient brakes.

This emphasizes the statement in the report of the Chief of the Bureau of Safety to the Interstate Commerce Commission for the year ending June 30th, 1917, that: "The maintenance of the air brakes to the point of maximum efficiency is a consumamtion to be striven for by all carriers, regardless of whether the grade on a particular line of road demands such efficiency in the ordinary movement of trains. Level roads should maintain their air brake equipment to the same degree as those having steep mountain grades."

CAUSES FOR UNSATISFACTORY CONDITION.

As will doubtless appeal to you, the "dead line" data for 1913 (See table No. 1) gave ample proof that freight brake

maintenance was very unsatisfactory, but we required the causes to effect a betterment. It may be said, in passing, that "cleaning with the stencil" was not an explanation.

After failing in an attempt to learn the causes by having brake cleaners report their findings, the four of us in 1914 took our over-clothes, wrenches, and test gauges and spent six weeks working with the brake cleaners at the various division terminals. We made gauge and soap-suds tests of a large number of brakes, including those just cleaned and others that had run for various periods. With each brake found to have over 5 lbs. brake cylinder leakage per minute from an initial pressure of 50 lbs. we personally located and remedied the faults, thereby instructing the accompanying, local brake cleaners. Other existing defects were treated similarly. The Air Brake Association recommends that no newly-repaired brake be considered satisfactory until it will pass the above cylinder leakage test, as well as other tests.

This work disclosed such opportunities for betterment that we repeated it in 1915 and 1916. It has convinced me that large roads should have a special man giving it regular attention, as more particularly referred to later.

The more common causes for brakes failing to apply or leaking off quickly, as indicated by Tables 1 and 2, are, in the order of their estimated proportions:—

1. Defective brake cylinder packing leathers, due to being worn, cracked, cut, porous, off center and applied reversed.
2. Loose brake cylinder piston follower nuts.
3. Dry and dirty brake cylinders.
4. Expanders out of place or not fitted.
5. Release valve or "bleeder" leakage.
6. Pressure cylinder head gasket leakage.
7. Cylinder pipe leakage with detached equipment.

The last mentioned is usually due to no provision for reasonable flexibility in the pipe, and to the cylinder moving when the brake is applied and released. On roads handling much of such equipment this cause for defective brakes will be relatively much more prominent.

In addition to the ineffective brakes due to the foregoing causes, as disclosed by terminal brake tests, are others resulting from:—

8. Bad-order brake rigging, such as rods broken, due to being cut by axles or to flaws, broken brake hangers and beams.
9. Good-order brakes received cut out and left so without

test, or cut out on the trip for insufficient reason, all uncarded.

10. Leaks at or near branch pipe connections to triple valves (requiring cutting out), due to shifted main brake pipes or to brake cylinders and auxiliary reservoirs being loose at the bracket connections.

11. Piston travel over 10". (Federal rules designate such as ineffective brakes.)

As regards brake beams, a recent tabulation on a mountain division of one road showed an average for a week, based on conductors' reports, of two beams down per day. The principal causes were hanger pins out or hangers broken. A partial explanation is the difficulty of seeing the hanger pin cotters and keys, due to the varied and obscured locations.

RETAINING VALVE.

Trains cannot be held down steep grades with the air brakes without the aid of retaining valves, and no part of the air brake requires less to maintain it if once properly installed; also, no part gets less needed attention. A very few years ago, while examining the piece-work list for freight brake repairs on a large, level-grade railway, the omission of any price for testing and repairing the retaining valve and its pipe was noted. The results are obvious. It is difficult for level grade roads, and even level grade divisions of roads having mountain grades, to appreciate that they must give these parts good attention if trains are to be handled safely down mountain grades. Willingness to pay mountain grade roads for repairs necessary to make retaining valves hold will not answer. The time now required to put the rest of the brake equipment in sufficiently good order is so excessive at mountain grade terminals as to generally preclude doing anything for retaining valves. We must depend essentially on the valve and its pipe being properly installed and on needed repairs being made when the brake is cleaned.

UNDERLYING CAUSE.

Rightly termed, the brake cleaning faults indicated are merely symptoms, and the real or underlying cause for this portion of the unsatisfactory freight brake maintenance is superficial inspecting, testing and repairing. The main reasons for this are undue haste, the pressure applied to get quantity without equal insistence on quality, unskilled men,

and insufficient supervision. A letter to X asks why less brakes were cleaned last month than the previous one, or why less than by Y. Then there is the daily, local pressure to "have those B.O. loads ready at ——— o'clock," and like pressure to have the repair track ready to pull at the appointed time, each occasionally requiring more speed than will permit of good work. The letter inquiry mentioned is always undesirable, as such comparisons canont be made fairly. If there is good reason to believe more should be done generally then the air brake man should personally lok into it on the ground. The daily pressure, understandingly applied, is largely necessary, but the almost entire absence of a balancing pressure and provision for good work, and the more or less inadequate time, lack of sufficient proficient workmen, and needtd tools and material to accomplish, will inevitably result in superficial repairing.

One very competent railway air brake man is confident that with good, initial brake installation and with efficient cleaning and lubricating freight brakes will, as a rule, be reasonably efficient for nine to twelve months. The results with many brakes apparently support this contention. But, even if this is impossible, the gap between it and the actual condition shown in Table No. 1 proves that a big improvement is easily practicable.

"WASTING MATERIAL."

A natural corollary of the quantity-only basis of repairing is the expensive "economy" resulting from failure to replace material that is worn out or otherwise defective. Illustrating: A gauge test of a newly-cleaned brake showed excessive cylinder leakage. Removal of the piston disclosed the cause as a badly-worn and cracked packing leather. The workman assured us that he had noted the condition of the leather, but that, as he had recently been "jumped on for using too many leathers," he thought he had "better take a chance on that one."

This was not local for at another point, where we found much better work being done, we were asked to test a large accumulation of removed packing leathers because there, too, they had been criticized for "using too many packing leathers." We did so, and found all so defective as to unquestionably warrant removal.

There is generally more reason to criticize undue retention of defective packing leathers, gaskets and rubber seats

for emergency valve than of applying new unnecessarily. All of such removed parts should be sent to a central point for inspection, so that any yet good may be saved, the best scrap value got from the others (pipe gaskets can be made from same), and to get ample evidence of wastefulness before criticizing adversely. Don't nag.

CAR BRAKE INSTRUCTIONS AND INSPECTIONS.

Various well-known factors have long operated to cause rather frequent changes in a portion of the freight car brake repair force, and the war has magnified this. The new men are seldom properly instructed, and there is little adequate supervision of the work done. The remedy is to give the General Air Brake Inspector an Assistant whose main duty will be to instruct the car brake inspectors and repairmen, inspect their work, and inform local foremen of results. His instructions should be largely demonstrations of train, repair track, and shop inspecting, repairing and testing, requiring over-clothes as part of his daily habit. The latter is imperative if he is to meet the demands.

A timely editorial in the Railway Age of Feb. 15th, 1918, says: "In the present emergency, and particularly with the large labor turn-over, it is more than ever necessary that adequate supervision be provided." Before the war the freight car brake equipment, complete, cost about $75.00 per car for the 8" size and $85.00 for the 10" size. Cleaning and repairing will cost over $1.00 per car per year. Multiply these separately by the number of cars owned and then consider whether the original investment and annual repair cost for cleaning only do not alone warrant a special inspecting and demostrating instructor. If more proof is needed designate one or more "dead lines," points where all ineffective brakes will be found and repaired before being allowed to pass, then tabulate the periods such have run since the previous repairs were made and the causes for the short-time periods.

TIME.

While trite to say that a car is earning alone when it is moving, yet we should ever keep this in mind so as to help avoid any unnecessary standing time. Mr. D. Willard, Pres., B. & O.R.R., in a remarkable address to the officers of that

road last June, gave some astonishing figures on this, as shown by the following quotation:—

> "We have had tests made by our own people, and they have also been made on other railroads, which show that the freight cars in this country are upon the average under control of the shippers thirty-seven per cent. of the time—thirty-seven per cent. the shipper has the car; six per cent. out of that thirty-seven being Sundays and holidays. That leaves sixty-three per cent. of the time of the car in the control of the railroad. Now, what does the railroad do with it? You may say, I suppose, that out of that sixty-three, probably forty-five or fifty per cent. of the time the car is moving on the road. Nothing of the sort. Only eleven per cent. of the total time of the car is it actually being moved. What happens to that other fifty-two per cent. of the time? Standing still in terminals, waiting to be switched, standing on connecting tracks with other railroads, waiting to be repaired, being moved from the yard where the train left it to the warehouse—and things of that kind. Only eleven per cent. of the time is the car actually in motion; only thirty-seven per cent. of the time is it under the control of the shipper; and the Baltimore & Ohio is not any worse than others—as a matter of fact, figures show that bad as we are we were slightly better than the average, but that is the problem that confronts the railroads."

He also stated that they were then making 28 miles per day with their freight cars, expressed the opinion that it should be 30, and advised that this gain of two miles a day would be equivalent to adding 6,000 cars to their equipment, and which would cost then, for steel hopper cars, approximately $15,000,000. He said also that for some months their bad-order cars had not exceeded 2½ per cent. But does such a measure imply that the air brakes on the balance are in good order?

We should keep prominently before us the statement in the Railway Age editorial of Aug. 24th, 1917, that: "The cars must be kept in good condition, and when repairs are made they should be done thoroughly so that the equipment will not spend an excessive time on the repair tracks." While the car air brakes repairs have not generally been made thoroughly yet making such repairs has not contributed seri-

ously to the percentage of bad-order cars, those out of service for repairs. If this percentage could, for this reason, have been a little higher on our Eastern lines during last summer it would have helped materially to prevent the serious troubles experienced during the winter from inadequate control down steep grades.

One time-saving not used as extensively as warranted is, where the destination of loads with defective brakes is a terminal, to mark them on arrival "B.O. when empty," with defect, and instruct switchmen to deliver same to the repair tracks promptly when empty.

THE INCOMING FREIGHT TRAIN BRAKE TEST.

It being obvious that we are far from the time when even fairly modern freight cars will reach the repair tracks for other work at such intervals as will permit of satisfactory brake maintenance, those with ineffective brakes in trains must be located and set out for repairs with the minimum possible interference with transportation. For this we depend on the train brake test. The defect card can be made to help a little, but not much.

Some claim that the train yard test plant is needed and useful for this. I believe it is not in other than the very exceptional yard, as in special service, such as oré, where there is unusual dead time with no switching to be done. Repairs cannot be made safely while switching is going on, and when a train is made up it should start with the least delay thereafter.

The outgoing freight brake test is, or should be, merely a check against error. To then set out defective brakes for repairs is to disorganize dispatching and switching, thus delaying cars ready to proceed and greatly augmenting expenses; hence, is as unthinkable as a means of maintenance as it would be to depend on an inspection of locomotives and reports of work needed alone when they were being got out for departure.

Immediately on arrival each train must have a general inspection under blue signals. Assuming that the proper brake application was made by the incoming engineer, a thorough brake inspection can now be given, minor repairs made, and cars with inoperative brakes marked for repair tracks, all during the time and protection afforded by the general inspection.

As the air brake inspection must be begun as soon as the

brakes are applied and must be completed quickly (not over 20 minutes and preferably less, so as to avoid an unduly severe test and the setting out of cars with reasonably efficient brakes) it cannot be performed by the men making the general inspection.

Under the above plan, the Yard Master is informed, before switching, just what cars are ready to proceed. Thus brake delays to departing trains are avoided, brakes are maintained, and incident expense is kept at the minimum.

But these desirable ends all depend on the correct performance of a simple duty by the incoming crew. The engineer must leave the brakes applied by a 20-pound reduction, merely adding to any reduction needed for stopping the amount necessary to total 20 pounds. It is preferable to have this made as one reduction, and some engineers do so by carefully making the stop with the engine brakes only, but the other method will have to answer in many cases to avoid the delay of releasing and recharging. Where time will permit of releasing, stretching the slack (hand brakes set at rear), recharging and then applying, a better inspection of draft gear will be possible.

If less than 20 lbs. is drawn off some brakes in condition to proceed will be found unapplied. On being sent to the repair tracks these will be found operative, and the inspector may be criticized for the unnecessary work and delay. Thereafter he will fear to bad-order brakes found unapplied, especially if there are several in a train. Thus there will be either useless expense and delay or brake maintenance will depreciate, with its resultant dangers and ultimate greater expenses, all due to even a few improperly-made incoming brake test applications.

The errors are due either to the engineer failing to make the proper reduction (even after drawing off 20 lbs. he will generally need to add more to have 20 lbs. off when the brake valve exhaust ceases) or to the brakeman closing the angle cocks (to cut off) before the reduction is completed. Yet the delay, if any, to make the test application right will not exceed 15 seconds. For this reason, the simplicity of the test, and especially because of the value of the inspection depends primarily on the application being made properly it is reasonable and necessary to require 100 per cent. efficiency in this.

War-time merely emphasizes the need for making the incoming brake test invariably and correctly. We must depend mainly on Road Foremen and Train Masters to, while

on other duties on the engine or in the caboose, instruct and check against errors and delinquencies. They cannot do so if they get off when entering yards. Carmen cannot check this. An attempt to do so under existing conditions would result only in more trouble for them.

Instructions to govern the method of making the incoming freight brake test, arranged so that they may be issued conveniently in bulletin form, will be found as Appendix A. These are the result of several years' experience with this test on one large road, being a recent revision.

Where, as in some instances at mountain terminals, trains arrive with 90 lbs., this should be reduced to 70 lbs., by suitable application and release, before making the test application. Tests from 90 lbs. are less severe because the high pressure left in the auxiliary reservois after the reduction of 20 lbs. will supply brake cylinder leakage longer than where the application is made from 70 lbs.

CAR BRAKE REPAIR ISTRUCTIONS.

It is generally understood that triple valves cannot be well maintained unless at each periodical cleaning they are cared for in a suitable room having among its facilities a standard test rack. At two points where experienced cleaners cared for good-order triple valves without removing them, but where instructions were to get a good-order valve from the nearby repair room to replace each found defective, the change was made to sending all valves to the repair room. The effect was shown by one shop repair foreman complaining of the additional work required on triple valves, other than cleaning, while the other and more far-seeing foreman expressed surprise that they had, considering the additional serious defects found and repaired, got along as well as they had. Both repair rooms had standard test racks.

The manufacturer's instruction book for use of the standard test rack gives much of the information needed to care for the triple valve repairs fairly well, but the men who maintain the rest of the brake equipment on the car have generally had to depend upon verbal instructions. To aid such men the Westinghouse Air Brake Co. has had certain of its men, who are closely in touch with such work, prepare instructions for the brake work to be done on the car, Mr. C. C. Farmer having been Chairman of this committee. I have secured permission to include these instructions and which will be found under Appendix B. While the length

of this paper precludes reading these instructions, any questions or suggestions regarding them will be welcomed. Please consider these instructions as representing in concrete form a large part of the remedies proposed for unsatisfactory freight brake maintenance. The drawing referred to in Paragraph 3 will not be prepared until additional information being sought indicates more clearly just what tools will best meet the needs.

PISTON TRAVEL AND BRAKE PIPE LEAKAGE.

Short piston travel (less than 6″) and brake pipe leakage render good braking far more difficult. A piston travel of 9″ is actually less objectionable than one of 6″. The former, by giving a much less increase for ordinary, braking reductions lessens slack action and consequent shocks, yet is almost as efficient in a full application as the 6″ travel.

Regarding the caution in Appendix A against altering piston travel until it has been determined, by ascertaining if a brake beam can be moved, whether the brake has partially leaked off, it will be of interest to know that tests made on a number of freight cars, starting with 50 to 60 lbs. in the brake cylinder, gradually reducing the pressure, and noting the amount remaining after each ¼″ recession or loss in piston travel, gave an average amount left of 30 lbs. after ¼″ recession. 20 lbs. after ½″, 10 lbs. after ¾″ and 5 lbs. after 1″. This explains the statement elsewhere that one inch loss in piston travel means the loss of all effective holding power.

The bad results from brake pipe leakage are much greater with long trains and increase more rapidly than the train length. That is, a rate of leakage that would not be particularly detrimental with 40 cars would prevent good handling with 80 cars. But as any leakage is detrimental and wasteful, and as the many moderate leaks, while harder to find and remedy in a train, make a large total leakage, it is very important that all such be located and stopped substantially when cars are on repair tracks. The needed results cannot be obtained without the soap-suds test. A loose pipe means a future leak, as also does a rigid pipe where the need of some flexibility is plainly indicated. One illustration of the latter is a branch pipe connection (from main pipe to triple valve) consisting of two straight pieces and one ell. Another that destroys the pipe fit in the triple valve and breaks the pipe is a retaining valve pipe connection run-

ning close to the auxiliary reservoir and horizontal or nearly so.

BRAKE HEAD SPACING.

In these days when conservation of material is of the greatest importance attention may well be given to the waste of shoe metal and brake efficiency resulting from the brake shoes that overlap the wheel treads. This is due to the old head spacing of 60½", magnified by manufacturing errors and the spreading action of the overlaping shoes. In addition to insuring that all new beams have the 60" spacing the errors should be rectified in repairing old beams.

EFFICIENT TRAIN INSPECTION.

Is not considerable of the unsatisfactory maintenance, and which extends beyond the brakes, due to lack of system, insufficient or untrained inspectors, and undue haste in train inspecting and repairing? Where a specified time is allotted for this work (a) is it based on tests with a certain number of reasonably competent men, modern inspection requirement, and certain car limits per train? (b) Is the number of men apportioned for this work generally adequate for the time allotted? (c) Do the switchmen, in an effort to meet the requirements of their superiors as to when trains must be ready to depart, prevent the inspectors from doing the work properly, as by emptying the brake pipe of air, bleeding uninspected brakes, and by commencing to switch the train before the inspector's work can possibly be completed properly?

These questions do not necessarily suggest the belief that the most thorough inspection required should be made of each freight train at every locomotive terminal, but if the rules require it and gross deviations occur regularly, due either to insufficient time or men, how can any really good inspection be expected? If the circumstances will not permit of or justify a thorough inspection at each locomotive terminal why not outline a less complete one for, say, through trains at alternate terminals, specifying for particular attention only the most important details?

Of course, the term inspection includes the making of needed repairs, either on cars while in the train yard or by sending them to repair tracks. Unfortunately, the tendency is against taking "the stitch in time," with the readily-appreciated results. For example, a cotter is seen to be

out, but is not replaced, possibly because its pin is yet in place. Or, piston travel of 9¾" is not shortened, maybe because it is not over the Federal limit. However, with competent men it is believed that the underlying reason will generally be inadequate time.

FREIGHT BRAKE REPAIRING AND STENCILLING.

The North West Air Brake Club of St. Paul, Minn., has proposed to The Air Brake Association a revision of M.C.B. requirements regarding brake repairing and stencilling, as follows:—

It is submitted that the present M.C.B. stencilling for freight brake cleaning, etc., can be simplified, time and money saved, brake maintenance improved and more use got from cars by adopting a rule that when either the triple valve or the brake cylinder must be cleaned, lubricated and tested, all other parts, including the retaining valve and, where had, the dirt collector, be cared for at the same time; also, that any other repairs needed by the brake equipment be made then. Stencilling should then be modified as follows:—

Use but two lines; the upper to show the shop or station letters indicating where the work was done, followed by the numerals indicating the month, day and year; the second line to be the initials of the road that did the work. Also, duplicate this on the opposite side of the reservoir or car so that one man inspecting can read all dates without frequently crossing over the train, as is now necessary.

The present requirements are to stencil on one side only, and that the shop mark, date and road be repeated each for the "Cylinder," "Triple," and "Dirt Collector," the parts to be lettered as quoted. There is now just enough room to get all of it on the auxiliary reservoir of an 8-inch equipment. The retaining valve is supposed to be cared for at the same time, but there would be no room for a similar stencil for it even were this desirable, as it is not.

The thought back of this separate and complete stencil for each part is that one may require attention, with incident billing if a foreign car, when the others may not. In the rare event of this being so it will be cheaper to care for all then: first, because the broken dates that would otherwise follow would require that the car be switched to the repair tracks twice as often and held from service doubly as long per year to care for the brake cleaning; second,

because in the necessarily-rapid work of inspection the presence of two or more dates increases errors; and, third, because of the additional expense, if, when a defective brake is found in a train and sent to the repair tracks, a test must be made to positively locate the defect before cleaning and lubricating are begun, as must be if only the then imperative work be done.

In that rare case where, for example, a triple valve must be changed (usually cared for in the train) and the other parts may be let go, time and money will be saved if the stencil is not changed and, if a foreign car, no charge is made.

In view of the obvious advantages of the foregoing and as the cost of switching a car to and from the repair tracks, with the time it must be out of service, mean a greater expense than the entire permissible charge for properly caring for all of the details covered by the present stencil it is hoped that the proposed change in the stencilling rule and in others relating to the work involved will be favorably recommended to the M.C.B. Assn. and will meet with their similar consideration.

APPENDIX A.

INCOMING FREIGHT BRAKE TERMINAL TEST.

To All Concerned—

Enginemen and trainmen of freight trains on arrival at terminals will leave the brakes applied by a 20-pound service reduction made from 70 pounds. Where engineman has made an automatic application for stopping he will, as soon as stopped, add to it by one farther, continuous reduction sufficient to make a total of 20 pounds, and, watching the gauge, insure that this amount is had when the brake valve discharge ceases. On its completion he will give one short whistle blast as advice to brakeman that he may cut off and to inspectors that inspection may begin. The brakeman will not close angle cocks until this signal is given.

When the train must be left on two or more tracks, or when crossings must be cut, those concerned will follow the foregoing plan before cutting off each part.

To avoid preventing inspectors from ascertaining the condition of air brakes switchmen, carmen and others must not discharge any air from the auxiliary reservoirs or brake pipe of cars that have not been inspected. Before discharging any air from those already inspected an angle cock must be closed between such and any uninspected brakes.

On brakes being applied, as indicated by whistle signal, inspectors will at once and rapidly examine for piston travel, brakes failing to apply, any that have leaked off and brake pipe leaks. At this time, make no repairs; merely indicate the defect with chalk. After completing inspection repair the defects that should be cared for in the yard. For other defects bad-order cars for repair tracks unless impracticable, as may be with perishable or time freight. The air brake and the general inspection must not be made by the same man or men.

Adjust incorrect piston travel (less than six inches or over eight inches) to seven inches, but before marking for apparent short travel, be sure, by trying a brake beam, that the brake has not partially leaked off. When a brake shoe can be moved easily, as with one's foot, the brake piston has leaked back one inch or more. Consider cars over twelve months since brakes were cleaned as having defective brakes. Loads that cannot be held for brake repairs earlier will, where destination is a terminal, be marked on arrival "B. O. when empty," with date, and defect. These will be delivered to repair tracks as soon as practicable after unloading.

Supt. Motive Power.

APPENDIX B.

MAINTENANCE OF FREIGHT BRAKES.

1. *Where Freight Car Brakes Will be Cleaned.*—Freight car brakes will be cleaned on all repair and shop tracks that are equipped with air pressure for brake testing; also elsewhere as may be directed by special instructions. Air brakes will not be cleaned at points where air pressure is not available for testing, except in cases of emergency.

2. *Responsibility.*—Foremen are responsible for air brake conditions on cars leaving the tracks under their charge, and therefore must know that the men they assign to do air brake work have the stipulated tools and supplies, and are familiar with and competent to carry out the following instructions.

3. *Tools, Equipment and Supplies.*—Brake cleaners will be provided with a supply of standard brake cylinder lubricant, soap, waste, clean rage, kerosene, quick-drying black paint, white paint for stenciling, a small quantity of graphite grease, and a set of air connections, tools and equipment, as shown on Drawing No. ——. When engaged in their work they will carry in addition to the tools a small pail of soap-suds, a standard dummy coupling, and such light supplies as are frequently required during brake cleaning and repairing.

4. *Attention to be Given Brakes on all Cars.*—The brakes on all freight cars on repair and shop tracks will be given attention as follows:—

4-A. Treat all cars marked for bad order triple valves or brake cylinders, such as where brakes either won't apply or leak off quickly, the same as required for system cars having cleaning dates over nine (9) months old and foreign cars with cleaning dates over twelve (12) months old (See Paragraph 6); that is, proceed to clean, lubricate, etc., (See Paragraph 7) without testing first to locate other possible defects.

4-B. With all cars, whether their brakes are in date or out of date, repair any loose or missing pipe clamps, (See Paragraph 23), angle cocks or hose turned out of standard position, (See Paragraph 37, loose brake cylinders, auxiliary reservoirs, (See their supporting brackets, brake rods worn by contact with wheels or axles, and in addition on system cars, angle cocks which are non-standard in position in relation to center line of car and pulling face of coupler knuckle. (See Paragraph 38.)

5. *Cars With Brakes in Date.*—On system cars having cleaning dates less than nine (9) months old, and foreign cars less than twelve (12) months old, proceed as directed in Paragraph 8, except do not close branch pipe cut-out cock, and include branch pipe, triple valve and release valve in the inspection for leakage. If there is leakage from the triple valve exhause (through the retaining valve(exchange the triple valve.

5-A. With the brake charged to 70 lbs. make a service reduction of 20 lbs. with the exhaust cock in the yard hose attachment. If piston travel is between 6″ and 8″ test for brake cylinder leakage by noting whether the brake shoes can be moved on the wheels with the foot within one and one-half (1½) minutes after the application was completed. If so repair as the leakage is excessive. If brake shoes cannot be moved, next inspect for clearance at the application ends of lever guides, etc. This should be ample to prevent striking with 12″ piston travel. Before making any changes to provide this on system cars insure that lengths of rods and guides and locations of latter are standard for such cars.

5B. If on making application specified in paragraph 5-A the piston travel is less than 6″ or over 8″, readjust to 7″ and then fully comply with instructions in paragraph 5-A.

5-C. Where the test in 5-A does not require that the brake be cleaned test the retaining valve and its pipe as directed in paragraphs 33 and 34, except soap-suds and repairs may be omitted if the brake shoes cannot be moved within one (1) minute after release (discharge at retaining valve) commences.

5-D. If either the triple valve must be exchanged (see paragraph 5) or the brake-cylinder cleaned (see paragraph 5-A) consider the car the same as one with a brake out of date, and proceed as directed in paragraphs 6 and 7.

6. *Cars With Brakes Out of Date.*—Thoroughly clean, repair and test the brakes on system freight cars having cleaning dates over nine (9) months old and on foreign cars having cleaning dates over twelve (12) months old.

7. *Procedure.*—Do cleaning, testing, adjusting and repairing of freight brakes in strict accordance with the following instructions and directions, and in the order given.

8. *Brake Pipe Leakage Test, etc.*—Having brought hose to the yard connection and tool kit to side of car, close the branch pipe cut-out cock, and, having seen that the opposite angle cock is shut, couple the yard hose (preferably to retaining valve end of car) and open the adjacent angle cock to charge the brake. Next, test for and repair leakage from brake pipe and fittings up to the branch pipe cut-out cock.

This includes hose coupling gaskets, leakage under hose clamps, through hose (porosity), also threaded and gasket joints, including the main brake pipe union. Open and close angle cock and thereby blow out brake pipe at the free hose. Listen at the coupling and test here for leaky angle cock. Replace if defective. Then connect dummy coupling to hose, open angle cock and complete leakage test here. Make all leakage tests with soap-suds where temperature will permit. (Se Paragraph 42). I connecting with the yard hose or the dummy coupling discloses bent hose couplings on the car, or if hose couplings have broken stop pins or are otherwise not fit for service, replace the hose.

9. *Brake Branch Pipe, etc.*—Obliterate the old stencil with the black paint, remove dirt collector cap, and loosen with scraper any solid matter in the dirt collector. Disconnect branch pipe at triple valve, pulling the branch pipe union connection no further from the triple valve than is actually necessary; otherwise leakage will be developed in pipe joints. Blow out branch pipe and dirt collector by opening and closing the cut-out cock. Coat threads of dirt collector cap with graphite grease and replace. Note, at open end of branch pipe, whether cut-out cock is leaking. If so, replace. Remove the short section of retaining valve pipe from the triple valve.

10. *Brake Pipe Strainer.*—Where there is no dirt collector the presence of much coarse dirt or scale in the triple valve strainer shows that the screen in the brake pipe strainer is in bad order. If found so replace the entire strainer and have the defective one repaired. Where this strainer is used in connection with a dirt collector it must not have a screen.

11. *Removal o fTriple Valve and Gasket.*—Bleed all air from the auxiliary reservoir, and remove the triple valve, being careful not to tear its gasket; then, after removing the triple valve strainer, turn the triple valve so that its branch pipe opening is downward and rap the side of the check valve case to discharge all dirt, after which apply to it the removed triple valve gasket and attach the opening protectors removed from the clean triple valve (draw bolts true and firm), thus preparing the dirty valve for shipment (See Paragraph 13).

12. *Disposition of Dirty Triple Valve.* Deliver or forward all removed triple valves and their gaskets to the specified

triple valve repair room, and from which a like number in good order will be obtained.

13. *Clean Triple Valves.*—Triple valves received for application to cars will be accompanied by good-order gaskets, in place, and have the several openings suitably closed with opening protectors, the latter to exclude dirt and protect thread and gasket surfaces.

14. *Triple Valve Gaskets—Foreign Cars.*—If a triple valve gasket is found in bad order on a foreign car replace with a new one, report for suitable charge and apply both the removed gasket and the one received with the clean triple valve to the dirty triple valve.

15. *Brake Cylinder Cleaning, etc.*—Disconnect and remove the push rod. Apply piston holder. Remove the non-pressure head and piston from the cylinder.

15-A. Thoroughly clean the brake cylinder, including the flange and joint to which the non-pressure head is bolted, first using the dull rounded scraper for removal of the heavy gum and grease, and wipe dry with rags or waste. If, as may occur occasionally, the old lubricant in the cylinder is so gummy that it cannot be wiped out, kerosene may be used to soften it, but must not be used where the cylinder can be cleaned without it. Clean the leakage groove. Examine the tube in the auxiliary reservoir and clean it if required.

16. *Piston and Packing Cleaning, etc.*—Make certain that the rivets securing the piston to the rod are tight. Remove packing expander. Turn flange of cylinder packing outward just sufficient to clean with dull, round-cornered scraper, and dry-wipe the packing clean inside and out. Kerosene, gasoline and other light oils must not be applied to packing leather, because they would remove the filler with which the leather packing is made air-tight, harden and crack the leather, and thus destroy its usefulness. Carefully inspect cylinder packing and if found cracked, cut, or worn thin at any point, or otherwise defective as would cause leakage replace it with a good one. Note the depression on the packing caused by the expander, as this will indicate uneven bearing and expander partly out of place. Examine the follower for cracks, then measure its diameter, and if it is ¾″ or more smaller than the rated diameter of the brake cylinder, replace it with one of

standard size. If the packing appears good, tighten the follower plate nuts. These nuts sometimes loosen in service and this causes leakage. Clean the joint and flange portion of the non-pressure head which bolts to the brake cylinder.

16-A. Where very cold weather renders it desirable and a convenient place is available clean the brake cylinder piston and make any other needed repairs to it in a warmed room.

17. *New Cylinder Packing Application.*—Before applying a new cylinder packing to the piston make certain that the studs are tight in the piston. If any stud is loose take off the nut and then screw the stud solid in the piston. Place the new packing on the piston so that the flesh (rough) side will come in contact with the cylinder wall. Apply the follower and the follower nuts, but leave the latter loose. Carefully adjust the leather centrally on the piston. Tighten all of the nuts lightly; then, after making certain the packing is still true, draw them firmly and evenly by tightening each a little at a time. The latter is to avoid cracking the follower and causing leakage.

18. *Packing Expanders.*—Exchange packing expanders for system cars with others that have been tested in and made to conform with a special gauge provided at points having triple valve test racks. Send removed expanders to the same point as the triple valves.

18-A. Do not exchange good-order expanders on foreign cars. If found defective replace and charge in the customary manner.

19. *Cylinder Lubrication.*—Using the grease brush provided, apply a thin, uniform coating of standard brake cylinder lubricant to the entire inner surface of the barrel of the brake cylinder.

20. *To Replace Brake Cylinder Piston.*—Apply the expander; then, seated or kneeling in the most convenient position, a little to one side (usually to the left) of the open end of cylinder, with one leg extended, non-pressure cylinder head resting on knee, and with gap in the expander away from cylinder, and piston facing upward, force expander into its recess in follower by pressing against the packing leather on opposite sides. Holding the expander in place, lift the piston

and, still keeping its rod as nearly vertical as the release spring striking the bottom edge of cylinder will permit, enter the piston edgewise into the cylinder until the latter will hold the expander in place.

20-A. Now, exerting a moderate pressure on the reelease spring close to the piston (alternating hands as later indicated) press the side of the first finger (fingers closed and thumb extended) against the packing close to one side of the cylinder and, at the same time, use the thumb of that hand, aided by the pressure of the other hand on the release spring, to force that side of the piston slightly inward. The side pressure on the packing must be enough to prevent it being cut or damaged by the edge of the cylinder end as the piston moves inward. Alternate this operation, reversing hands, until the piston is entered sufficiently to prevent its packing being damaged by the edge of the cylinder end.

20-B. Next, moving the free hand to the end of the piston rod, and slipping a coil of the release spring over the bottom edge of the cylinder as necessary, gradually force the piston into the cylinder until its top is two or three inches inside. This will require that the rod end be gradually raised, but do not raise it more than necessary.

20-C. During this time and later do not allow th eupper half of the packing to be turned back at all. This can be prevented by needed pressure with the ends of the fingers. The dull-edged, round-cornered scraper may be used to aid in this, but do not under any circumstances use any instrument that could cut or scratch the packing.

20-D. Next, raise the piston rod to its normal, horizontal position without allowing the top of the piston to travel inward, thereby insuring against the packing being doubled back, observing the following. As the end of the rod is gradually raised work it slightly from side to side and pull the bottom of the piston outward fast enough to prevent the top from moving inward.

20-E. When the ro dis horizontal push the piston about halfway in, then rotate the end of the rod around the center line of the cylinder at a distance of about 3″. If it binds this shows that the expander is partially out of place. If so remove the piston and replace more carefully. If the piston

binds at any time while being applied do not force it as to do so may damage its packing.

20-F. The foregoing instructions may have to be varied from slightly where there is little room near the open end of the cylinder, but should be followed as closely as conditions will permit.

20-G. Complete by pushing the piston to the far end of the cylinder and rebolting the head. Draw the nuts uniformly and a little each so as to insure a full, true and firm bearing of the head against the cylinder. Re-apply and connect the push rod.

21. *Triple Valve Application.*—Clean the gasket bearing on the auxiliary reservoir, place the gasket on the clean triple valve and then the valve on the reservoir. Holding the valve true against its joint, run all nuts down to a very light contact with the triple valve flange, then tighten firmly, drawing each a little at a time so as to insure a true bearing. Clean and apply the triple valve strainer. Make the branch pipe union joint face substantially true with its connection to the triple valve, then apply a gasket cut from a discarded hose coupling gasket (do not use new gaskets), and tighten the union.

22. *Inspection While Brake is Charging.*—Open the branch pipe cut-out cock and, while the brake is charging, make certain that the release valve is tight in the auxiliary reservoir and that its vent valve does not leak. Note whether there is leakage at the triple valve exhaust, and if so locate and correct before proceeding. Open the release valve with each of its rods. If it fails to vent or will not close without assistance locate and remedy the cause.

23. *Pipe Clamps.*—Clamps must hold their pipes firmly, prevent vibration, and not allow the brake pipe to shift lengthwise if air hose are pulled apart, as in a break-in-two.

24. *Piston Travel Adjustment.*—When the brake is charged to 70 lbs. apply by making a service reduction of 20 lbs. with the exhaust cock in the yard hose attachment. Measure the piston travel, and if less than 6″ or over 8″, release and readjust to 7″.

25. *Foundation Brake Rigging.*—With the brake applied inspect the foundation brake rigging to see that levers have ample clearance in their guides and elsewhere (see paragraph 5-A), that all cotters are in place, and hangers and dead lever fulcrums are secure, that the brake levers are standard, that rods are not being cut by axles, and that the rigging in general is in good order.

26. *Loose Brake Cylinders and Reservoirs on Their Supports.*—If the brake cylinder moves during application or release, or if any of the cylinder or reservoir bolts are loose or gone or lock nuts missing, needed repairs must be made by the brake cleaners unless this work has been assigned to other workmen, in which case brake cleaners will not report the brake in good order until any necessary repairs have been completed. One man can observe for movement of the brake cylinder and reservoir and their supporting brackets by bleeding off the brake. Movement of these parts causes pipe leakage and breakage.

26-A. When brake cylinders and reservoirs are to be tightened on their supports run up two or three of the nuts only sufficient to bring the bolting flanges into light contact with the supports. Then, if the bolting flange is not in contact with the supporting brackets at each bolt hole, line up with cut washers where required. A failure to do this will result in springing and cracking auxiliary reservoirs and springing brake cylinders out of round.

27. *Bracket Cylinder Leakage Test.*—Test the brake cylinder for leakage as follows:—Connect the test gauge to one of the triple valve exhaust ports and insure that the plug in the other is tight. The brake being charged to 70 lbs. apply with a service reduction of 20 lbs. Close the test gauge cock and release the triple valve so that gauge will show the cylinder pressure, which should be 50 lbs.

27-A. If the gauge now shows less than 50 lbs. reapply lightly and release until 50 lbs. or more is had. Try to avoid getting over 60 lbs. If over 50 lbs. reduce to this amount with the test gauge cock, then note the loss, if any, during the next minute. Any loss is the amount of brake cylinder leakage. If it exceeds 5 lbs. per minute with a brake that has just been cleaned the cause must be found and leakage reduced to not over 5 lbs. The most common sources of brake cylinder leak-

age are the cylinder packing, the brake cylinder pressure head gasket, the bottom of triple valve gasket and, with detached equipment, the pipe connecting the auxiliary reservoir and brake cylinder.

27-B. While testing for cylinder leakage, if temperature will permit, apply soap-suds around the piston rod next to the cylinder head. If non-pressure head has a vent, as with old patterns, cover with wet hand. If the piston packing is leaking this will now usually be indicated by bubbles around the rod. If the cylinder packing is not leaking and leakage is indicated by the test gauge, test the other joints mentioned.

27-C. If the pressure rises during the brake cylinder leakage test there is leakage past the emergency valve, the check valve case gasket, the triple valve slide valve, the triple valve gasket or the tube through the auxiliary reservoir into the brake cylinder. Locate and repair before continuing the test for brake cylinder leakage. Leakage into the brake cylinder may be present without the gauge pointer rising, as where there is an equal or greater leakage out of the brake cylinder. The use of soap-suds as directed during the brake cylinder leakage test will aid in detecting such a condition.

28. *Cylinder Gasket Replacement.*—A defective cylinder head gasket in the combined equipment (cylinder bolted to reservoir) can be replaced without removing the parts from the car if the cylinder head bolts are accessible, as follows: Clamp the piston rod close to the cylinder head, as in cleaning a brake cylinder; loosen or disconnect, as necessary, the branch pipe connection to triple valve; suport the auxiliary reservoir, and slack off or remove, as required, its bracket bolts; remove the cylinder head bolts, and then carefully pry the reservoir back enough to clean the joint and insert the new gasket. The auxiliary reservoir may have to be entirely detached at all points. As the gasket can be applied more accurately from the inside of the cylinder when the auxiliary reservoir is not removed, always combine this work with that of cylinder cleaning where practicable.

29. *Cylinder Packing Leaking After Cleaning.*—If the cylinder packing is leaking cut out the brake, bleed all

air from the auxiliary reservoir and repair as instructed in Paragraphs 15, 17 and 20 to 21.

30. *Disposition of Old Packing and Gaskets.*—All brake cylinder packings, cylinder cap gaskets and check valve case gaskets removed because defective, will be cared for in a manner to prevent further damage to them and, except as directed in Paragraphs 11, 12 and 14, turned into the storeroom not later than the first day of each month for disposition as directed by special instructions.

31. *Retaining Valve Cleaning and Inspection.*—Remove the retaining valve cap, then the valve; clean the vent port but do not increase its original size; moisten the valve seat, rub the valve on its seat and then wipe clean. Finally wipe and blow the case clean and replace the cap. With the weighted type of retaining valve if wear allows the weight to rest on the bottom of the case replace the entire retaining valve. The retaining valve must have a good-order handle, be in a vertical position and firmly attached to the car.

32. *Retaining Valve Pipe Inspection and Installation.*—While the retaining valve pipe is disconnected try it for loose joints by a moderate twist at the free end, and make any needed repairs. After reconnecting see that it is clamped or stapled at a distance of six feet from both the triple valve and retaining valve, and at about six feet intervals between these two points. It must not vibrate when car is running.

32-A. Before entering the end of the retaining valve pipe which screws into the triple valve make certain that the thread is good, and that the used thread is not long enough for the end of the pipe to come in contact with the brass bushing in the triple valve body. After applying this short section make certain that the two halves of the adjacent union are tight on their pipes, and that the union joint faces are true with each other. If the union is of the flat-joint type apply a good standard gasket.

33. *Retaining Valve Pipe Test.*—Turn up the retaining valve handle. With brake charged to 70 lbs. make a service application of 20 lbs. Open the by-pass in the test hose attachment and, as soon as the triple valve moves to

release position (indicated by blow commencing at retaining valve), start at the triple valve and quickly apply soapsuds to all of the joints of the retaining valve pipe to determine if they are tight. Repair any defects found and retest, repeating this operation until the pipe is tight.

34. *Retaining Valve Test.*—The brake being operated as directed in Paragraph 33, the retaining valve must hold enough pressure to prevent moving the brake shoes on the wheels with the foot or other convenient means within one and one-half minutes after the triple valve moves to release position. It is permissible to jar the vertical section of the retaining valve pipe to aid the retaining valve in seating accurately.

35. *Retaining Valve Pipe Renewals.*—If a retaining valve pipe runs from the end of car as directly as possible to the triple valve connection any looseness of the cylinder or springing of its supporting bracket will break the pipe or the boss at the triple valve exhaust port or destroy the latter's threads. To avoid this the triple valve end of the pipe must have flexibility. Where repairs must be made for other reasons repipe as follows:—

35-A. Run the long section horizontally until almost all in line (across the car) with, but higher than, the triple valve exhaust port. Then bend down to connect vertically with a union on a bent nipple that should connect to the exhaust port. Properly made this bent nipple, when laid in the angle of a square, will not touch the edge of the square for about 3″ each way from the corner, thus providing a gradual bend, and each end will be 7″ from the corner of the square.

36. *Angle Cock Test.*—When yard hose is disconnected and with brake pipe yet charged note whether the adjacent angle cock is leaking, testing as instructed in Paragraph 8 for the other one, and replace if defective.

37. *Angle Cock and Hose Coupling Positions.*—The angle cock must stand 30° from vertical, which will point the hose toward the center of the track. Turn air hose in the angle cock to such a position that when the couplings of two are raised to connect neither hose will have to be twisted. If coupled hose twist to one side when charged the couplings

did not face properly before connecting. This damages gaskets and shortens life of hose.

38. *Angle Cock Location.*—The standard position of angle cock is designated by the M. C. B. Association. When repairing foreign cars endeavor to maintain the owner's standard position for that car. On system cars mantain the M. C. B. standards, conforming to drawings where had.

39. *Stencil and Stencil Records.*—Stencil the date of cleaning and testing on the auxiliary reservoir in accordance with the M. C. B. rules.

39-A. Keep a record under dates when work was done, of initials and numbers of all cars upon which the brakes are cleaned and tested, the old stencil and the new stencil, and on foreign cars of the materials used for repairs. Include all of this in monthly or other reports as directed in special instructions.

40. *Hand Brake.*—Apply the hand brake and inspect it to determine whether it is in safe, operative condition. The chain must not catch on the staff support, and the rods, levers, etc., must be free from any interference that would prevent the delivery of hand brake force to the brake shoes.

41. *Brake Cleaning by Two Men.*—The instructions given in the preceding paragraphs cover the procedure when the work is to be done by one man. When a "helper" is assigned to assist in cleaning a brake the order of doing the work must be followed as closely as practicable. One man at a time only should tighten nuts securing cylinder heads, piston followers, and triple valves, as two cannot draw the nuts uniformly, as directed.

42. *Use of Soap-Suds.*—The plain soap-suds is not, as a rule, as good for locating leaks as a lather and uses the supply faster. To make a lather twirl the brush back and forth rapidly in the soapy water by rolling the brush handle between the palms of the extended hands.

Chairman:

I think you will all agree with me on the importance of the lessons in the paper read by Mr. Farmer. He has covered all the points very fully, as we expected he would. I do not wish

to take up your time because we have several gentlemen to hear from.

I am going to call on one of our most welcomed visitors to open the discussion this evening, a man who has been in the air brake business almost since its inception. He is now President of the Air Brake Association, and Supervisor of Air Brakes of the New York Central Lines—west of Buffalo—a road noted for its high speed passenger trains, as well as the extreme length and speed of freight trains. The gentleman to whom I refer is Mr. C. H. Weaver, of Cleveland, Ohio, who during his remarks will give us some insight into the methods practiced by his company in their endeavors to maintain freight brakes, in order to comply with the operating necessities of their road. Mr. Weaver.

Mr. C. H. Weaver:

Mr. President and gentlemen, it is surely a great honor to be called upon to open the discussion on Mr. Farmer's paper.

Knowing his ability as an investigator and writer, I am sure he has covered the subject so well that there is little left to be said on the subject.

I believe we all realize the importance of the freight cars. More so now than ever before. We are at war and the cars are necessary as a means of getting supplies to the front. Canada, who has sent so many of her sons to the front, must realize how necessary it is to keep the freight cars in service that there be no delay in getting supplies moved promptly.

I cannot plead the usual excuse that I did not have the opportunity to read this paper, as I did have a chance to read it and study it, and the more I studied it the less I found to criticize, but I may be able to add something that will substantiate the points brought out by Mr. Farmer.

Volumes have been written on the question of maintenance and why the brake should be maintained to its highest degree of efficiency, but I have as yet never heard the question asked why all this maintenance and what makes it necessary to be repeatedly doing the same thing over and over again. Is it because there is an inherent weakness in design or because there is not a proper initial installation of the apparatus that tends toward causing a great many of the defects found, and repeated temporary repairs, without arriving at the cause of trouble.

Too often proper attention is not given to the installation of the apparatus, and it would seem after an inspection of a number of cars that the idea prevailed that most anything was

good enough, because it is only a freight car. Let us consider for a moment the millions of capital invested in freight cars, and the more millions spent annually in maintenance, the cost of which is constantly going up. Would it not seem advisable to give more thought to the things that are in a great measure responsible for this constant need of attention. Even though the initial cost of a better installation was slightly greater, we not only see the cost of repairs increasing, but we have the delays to trains to contend with and loss of air, which costs money to compress. Just what this loss of air and its effect on train operation means has been shown many times.

Never in the history of railroads was the necessity of freight cars more urgent than now, and everything that causes delays to cars means delay to operation, for example, take the derailments caused by broken beams getting down on the rails. In the 1915 M. C. B. Proceedings a statement is made that about 37% of the derailments on one road were from this cause, and after seeing the slip shod methods of repairs made, I do not wonder at it, and in many cases the original installation is responsible.

A recent inspection to determine the condition of brake cylinder reservoirs and brake pipe was made on 150 box cars, of wood and steel underframes. On cars with wooden block support for cylinder and reservoir 53% were loose, on cars with metal support 45% were loose. Wood end sills, 30% of the brake pipes were loose, on metal end sills 17%. It seems to me that this cycle of defects will keep on until the fact is recognized that a better and lasting installation must be made. A few cases of defects are herewith cited to substantiate the above claims. These, it must be understood, are only a few in many hundreds, I might say, thousands of cases that can be found in most any railroad yard of to-day. For obvious reasons simply car numbers will be quoted:

Car 69307—Nail in brake hanger pin, cotter keys not spread in key bolt on bottom rod. This car off of repair track only 30 days.

Car 57190—Reservoir brackets loose. Car off repair track 60 days.

Car 17462—Reservoir loose and hanging down, crossover pipe and induction pipe practically carrying the weight of the reservoir. No date on car.

Car 342450—Reservoir bolts loose with induction pipe and crossover pipe carrying weight of reservoir. Car off of repair track one week.

Car 19465—Reservoir loose and hanging down. Car off of repair track five months.

Car 18741—Reservoir loose and hanging down with crossover pipe and brake pipe carrying weight of same. Car off of repair track one day.

Car 28529—Had a bolt 1″ x 8″ long in brake hanger without any nut, and when train was stopped beam was just barely hanging, also no cotter keys in bottom rod key bolt.

Car 13480—Cylinder block broken and hanging down 2″.

Car 18309—Cylinder block split and loose, hanging down 1″.

Car 324842—Brake cylinder pipe broken off at cylinder pressure head. This was caused by loose cylinder hanging down 1″.

Car 25764—Brake cylinder loose and hanging down 1″ from block. This car came off repair track and had new crossover pipe, new 1¼″ cut out cock applied, but nothing was done in the way of tightening up the cylinder.

I could continue citing such neglect of proper repairs being made when cars are on repair track, but the above is sufficient to show the necessity of a better initial installation, as well as proper repairs being made when cars are on repair tracks.

Another important feature that is much neglected is the proper inspection of air hose for defects. A recent inspection of 95 hose showed 69 to be porous. The ages of these hose ranged anywhere from 8 months to 3 years and 10 months. This shows the importance of a soap-sud test to be made to determine porous hose.

It is a poor physicion who after a diagnosis, does not prescribe a remedy. The following is offered as a remedy for some of the causes mentioned:

1. All brake cylinders and auxiliary reservoirs be attached to metal brackets and brackets be riveted to steel underframes.

2. All bolts fastening the cylinders and reservoirs to the brackets be double nutted and cotters or lock nuts be used and on wooden underframe cars the bolt heads holding bracket to car be set in cocket washers and washers to be set in the floor. All bolts to be of proper diameter and length.

3. All trucks be equipped with brake beam safety straps riveted to spring plank.

4. Two stirrup hangers be applied to spring plank when one is not found to be sufficient to keep the bottom rod from striking when one end is disconnected.

5. The solid end brake beam hanger in place of the common eye bolt type.

6. All brake beam brake levers and brake hanger bracket holes to be maintained round, this to be done by plugging and re-drilling and where necessary bushed.

7. All cotter keys to be of proper size and properly spread.

8. That more rigid inspection be made to see that proper size pins and cotters are maintained, reservoir cylinders and pipe clamps are securely fastened.

9. Air hose couplings to be gauged with M. C. B. master gauge when hose are mounted.

10. All piping and air hose to be tested with soap suds when cars are on repair tracks.

11. Angle cocks to be removed, cleaned and tested, as nearly 75% of leaking angle cocks can be reclaimed and be made fit for service by this method.

12. On account of the breaking of the pipe between the auxiliary and brake cylinder, careful attention should be paid when putting this pipe up to see that it is under no strain.

Mr. Farmer has called attention very clearly and forcibly to the necessity of proper maintenance. It seems to me the time has arrived when other things should be considered, and as I have pointed out, the question of a proper installation is a vital one. I have heard the question asked why should the holes be uniform in size and bolts of proper length that hold the reservoir and cylinder. I have seen on new cars where a ½ inch bolt was used because the holes did not line up, and in a short time we would lose reservoir and cylinder, causing leakages.

Why do brake beams come down. Go out into most any freight yard and see the different methods of application and you will find beams with hangers too short, badly worn heads, brake heads sprung, badly worn hangers and pins, and hanger pins too small and often without a cotter key.

A large number of brake shoes are found missing due to brake heads being too light, worn lugs so that shoes do not fit properly and keys jumping out. The key should be bent at the end to prevent this.

The chairman made mention of the long freight trains we were running, and would like to know what we were doing to better the conditions. In some of our yards we have special men assigned to tighten up reservoirs and brake cylinders. In all yards men are assigned to inspect and make necessary repairs to outgoing trains. In one yard, where trains are made up to go down a bad grade, we have sufficient men to put

every car in condition before leaving and they are given the time to do so. Of course, it is impressed upon them that no unnecessary time will be allowed.

Cars on repair tracks have the brake equipment tested with soap-suds.

I think that I have taken up more time than I should and wish to express my appreciation for the privilege of being allowed to express my views in connection with this paper and will close by saying that I concur in all Mr. Farmer has said.

Chairman:

I should like to ask Mr. Winterrowd if any road on this continent has ever rivetted on their cylinders and reservoirs to the sill brackets.

Mr. W. H. Winterrowd:

We tried that in a number of cases but it did not work out very well on account of the rough surfaces and being unable to drive up the rivets without breaking the ears on the reservoirs. In this connection, it is entirely wrong to hang the reservoir from the bracket. It should rest upon the bracket in order to get the support of the bracket. That should be looked into to get out a better design.

Chairman:

Another point that interested me in this paper was the statement that 37% of derailments were caused by brake beams dropping down. I do not know from memory how many we have had on the Government Railways due to this, but I know we have a large number. About six months ago we started the practice of connecting our brakes so that connecting rod will pass between the upper and the tension member of the bolster and the lower part of the truck lever is connected to the brake beam. When connected this way the brake hanger pin can drop out and the beam will not fall on the track. We have also practically eliminated the danger to car men in adjustment of the brake by removing the adjusting feature from the truck. We have some 15,000 cars under construction; 14,000 of which will have the adjustment made on the lever near the brake cylinder. The bracket is of sufficient length so that it will wear out a set of shoes. I do not know of any other railway equipping cars in this manner. It is not new to hang the brake rigging in the manner I have described, but the adjusting of the brakes at this point is a new departure. Mr. A. B. Brown,

of the Westinghouse Air Brake Company, spent several days with us at Moncton and worked out the details and equipped a sample car, and was successful in getting this to operate. The car was tested around curves and worked very satisfactorily, and I feel we are now going to get our brakes adjusted and also practically eliminate the trouble of brake beams falling down and causing derailments. If this is accomplished it will be due to the efforts of Mr. Brown, who started this on the Canadian Government Railways.

About the deadline proposition. We started this at two points, Chaudiere Junction and Truro. We were surprised when we started this deadline to find number of brakes that would not pass inspectors, whom we had placed in the yards to do nothing else but air brake work. We did not get 100%. That was impossible.

We make a specialty during the Summer months of air brake cleaning, as we find under severe weather conditions during winter months we cannot get men to stay under a car in a yard to do proper air brake cleaning, but you can get the brakes cleaned in shop during the winter. One speaker here mentioned about 2½% of the cars set out as "bad orders." That means 2½% remaining at night for repair. We have 6% set out daily, which, if not on the repair tracks, are going through the shops. Repair the brakes properly on the repair tracks and shops and you will not need as many men in your yards. Are men cleaning brakes on the repair tracks doing it in the proper way? Not only should the brakes be cleaned, but the triple valve should be taken to the shop and put on the test rack where it will receive proper attention. The men who clean the brakes should also do adjusting. If freight yards are not piped for air, the men can do the adjusting by setting the hand brake, measuring the push rod for piston travel and make adjustment.

The question has also been raised about trouble in the winter time. Our friends in the south are not familiar with what we have to contend with. The hose condition is serious, due to cold weather causing rigid hose, and the air brake men devote 50% of their time to stopping leaks in the air hose gaskets. Inspection should be made as soon as the engine is coupled on to train, and the train stretched out so as to find the defective hose gaskets and have same remedied. On the Lake Superior Division of the C. P. R. I have known cases when engine had coupled to train in yard, it required 1½ hours to get sufficient pliable hose and gaskets so that the pump could maintain the maximum train pipe pressure, this

same trouble happened every time the train went into a siding between divisional points where the slack was bunched and the train stayed there over fifteen minutes, when it again started and stretched out the slack in train the hose would leak at the gaskets.

Another of our good friends, who has travelled a long distance to be with us on this occasion, is Mr L. H. Albers, Supervisor of Air Brakes of the New York Central Lines—east of Buffalo. Mr. Albers is one of the pioneers in the brake business, and has rendered aid of inestimable value in all movements tending to improve brake conditions, not only in his official capacity, but also through his membership in the Air Brake Association, of which he is one of the past presidents.

Gentlemen, I am sure you all join with me in assuring Mr. Albers that we will be pleased to have him speak to us at this time. Mr. Albers.

Mr. L. H. Albers:

Mr. President and members of the Canadian Railway Club, in coming to Montreal to-day I had the pleasure of meeting a representative of the Canadian Pacific Railway, also one from the D. L. & W. road. My co-partner, Mr. Weaver, who represents the New York Central, west of Buffalo, paid particular attention in his remarks to details and gave the number of cars which showed enormous defects. I do not know whether he was referring to the C. P. R., the Lackawanna, or to our own road, but I am here to confess that no matter what road we are connected with we should realize the importance of any improvements which can be made in the movement of freight trains with despatch at this particular time, and this makes the question of freight brake maintenance one of the most prominent and yet the most intricate question of the day, since the excessive increase in car mileage as compared with previous years means more brake applications, with resulting wear and tear of brake equipment. The necessary withdrawal of a certain proportion of these cars from active service for repairs means that more cars will be required.

If proper maintenance is given we know that less shop work will be required, and time will be saved in pumping up trains in the yards, all of which assists in getting trains over the road with the minimum delay, which is the desire of every true Canadian and American at this time. To bring about proper maintenance I believe it is necessary, in the first place, to get proper co-operation between your draughting room and your general air brake inspector, or the fellow who supervises

the air brakes or looks after them from the supervisor's standpoint. From past experience it is found that cars to-day (as brought out by Mr. Weaver) have a very poor installation of air brakes. On some roads the mechanical engineer gets out the design, or it is gotten out by a draughtsman, and approved by the mechanical engineer, and then by the master car builder. The man in the field who is looking after the brakes never even knows that new cars are coming until these cars arrive, and in order to bring about better brake maintenance on all roads where there is lack of proper co-operation between the field man and the draughting room, steps should be taken to secure this essential feature, immediately ,and I am sure if this were done we would have less brake work to do after the cars were received in road service.

The next improvement in this air brake work should take place in the repair yards. If the brake has been properly installed when the car was in the shops for repairs, and the whole brake equipment gone over, the car should last at least one year without giving trouble. Mr. Weaver brought out one thing, that is, suspending the brake cylinders and reservoirs from brackets. On many cars to-day you do not have to have the car charged with air to find out its condition, and if you simply go over the cars, even casually, you will find conditions that will make you cease wondering why our trains are delayed on the road, due to faulty brake conditions.

In looking over the paper I find one thing in connection with cylinder lubricant. It refers to using a brush to apply the lubricant. On our road we had a committee formed who decided on the amount of lubricant to be applied to the various size cylinders and at each point was supplied with measures holding the proper amount, and one of the men supplied with a cotton mitten to be used in applying the lubricant, and by using this mitten and the measure we have derived considerable benefit. I do not know that I can add anything to the paper, as the subject has been well covered, but I do want to emphasize the fact that in order to get the trains over the road, whether we have hills to descend or whether on the level road, everyone should take a greater interest in this air brake work, especially since its relation to traffic is so vital.

Chairman:

Every man in this room is more or less familiar with the Lackawanna Railway, "The Road of Anthracite,' the road invariably chosen by Miss Phoebe Snow on her trips between Buffalo and New York.

The Lackawanna is not only noted for its cleanliness, as vouched for by Miss Snow, but is in a splendid condition financially, a result of far-seeing and most efficient management.

I understand that their brake conditions are on a par with their financial strength, and I am delighted to be able to state that we have with us a gentleman, who for many years has contributed in a very large measure not only to the good brake conditions, but also to the success of the Lackawanna operations as a whole.

Our guest to whom I have referred is Mr. P. J. Langan, the Democrat from Scranton, General Air Brake Inspector of the D. L. & W. Railway at Scranton, Pa., and it will be a pleasure to hear from Mr. Langan at this time.

Mr. P. J. Langan:

Mr. President and members of the Canadian Railway Club, my political associations are such that I believe democracy is going to win. For that very reason I am glad to be called a Democrat. The paper, as read by Mr. Farmer, requires no criticism from me, only this that Mr. Farmer could have gone further and made the conditions much worse and yet have stated the matter right. In speaking to my good friend, Mr. Brown, I was telling him that during the past winter I have not been over 53 miles from home and yet have been home less than at any time during the past twenty years, and this has been due to air brake conditions. I never saw worse conditions, and have been in the air brake game for over 25 years, and if the same conditions prevail for another year it will be impossible to handle trains without the use of hand brakes, unless we maintain a higher efficiency. We will all agree that Mr. Farmer's paper is correct and that we need better maintenance.

I am going to change a little from the subject, but to show the importance of air brake maintenance—only two weeks ago one of our heavy freight trains on a descending grade had a broken wheel. A four-engine train was coming up the grade and the car when it became derailed caught the tender of the first engine, turned the tenders of both engines over, two engines on lead and the pressure on the rear two engines pushing buckled the train in four places. We had five wrecks and the whole trouble was caused by blocked retainers resulting in the wheels becoming overheated. If we maintain the air brakes properly it means that the amount of overtime will be cut down to a minimum and the Operating Department will get use of the power which they do not get at the

present time. During the past winter I have seen trains, due to air brake conditions, go penalty before they were forty miles over the division where they had to go 140 miles, and I also know of a case where on 48 cars the air brake would not apply with an emergency application on 22. This is due to lack of maintenance. We all say it is foreign equipment. Make the foreign your own car instead of trying to blame the other fellow, and put the brake in good condition, eliminate piece work. The next thing to do is to get more men to do air brake work and bring the good conditions back as quickly as possible. I have in mind a wreck that occurred about five weeks ago on an eastern road that cost $250,000, and was of such a nature that the cause could not be definitely determined. The D. L. & W. had a very peculiar case during the winter, and one which would have been serious had it not been for the good condition of the brakes on the train. We had a heavy train descending one of our grades and ice which had accumulated inside the brake pipe became loosened and blocked the angle cock on the first car back of the engine. The engineer immediately called for assistance. At the time there was 75 lbs. pressure on the air gauge in the caboose and the conductor instead of using the conductor's valve in the caboose went out on the train to see what was the matter and did not think it necessary to open the valve. The train arrived at the bottom of the seven mile grade without the least bit of damage. The angle cock was freed from ice and the same train was taken down grade twice as long without any work being done on the brakes, which showed that the brakes were in proper condition, whereas if the brakes had been in bad shape there is no doubt but that a wreck would have happened that would have cost the Lackawanna $100,000, and perhaps the loss of life. Maintenance we must have. Time is secondary. Forget the cost for the time being until we get back where we belong. As Mr. Farmer said, it costs a lot of money to maintain the brakes properly, but it is money well spent and the Lackawanna realizes this, although it is just as hard to get money out of that as any other company. The conditions are such that if Mr. Farmer had increased his percentage by 25 he would have been entirely right. When an engineer handles a train with the knowledge that the brakes are in good condition it produces contentment in that man's mind for the remainder of the trip, but if the brake conditions are bad, and the man's judgment is poor, we then have a combination that is dangerous. We keep as near to safety first as possible, but we realize that men are going to

take chances, but even if an engineer's judgment is poor, if you give him 90% good brakes he is going to reach the bottom of the grade safely. One serious wreck will pay for all inspectors and material used in a yard for years, then why not take the time and money to put the brakes in proper condition. Last winter was unusual. We never experienced anything like it but we saw that the inspection was made, regardless of time, and if we did not get 90% efficiency we did not let the train depart, and neither the Supt. Yardmaster nor the trainmaster can command a train to leave when there is a blue flag upon it. Maintenance will also overcome a lot of defects of engineers and engineers will check the fellow who lets down on his work in the yard.

Chairman:

We have a few more of our friends from the south. I would be glad to hear from Mr. Crossen, of the D. & H.

Mr. Crossen:

Mr. Chairman, I have listened with interest to the papers. The conditions have been bad, as Mr. Langan has shown, but we are making an effort to have our brakes put in proper condition before next winter.

Chairman:

What about our Canadian friends—Mr. Hatch?

Mr. H. J. Hatch:

Mr. Chairman and gentlemen, I feel a little diffident about trying to criticize a paper written by Mr. Farmer. All I can do is to confirm everything he has said, and, as Mr. Langan has said, if you will go into the subject further you will see that he has not stated it all, and anyone who does not believe it should go into one of the yards and make few tests. After all these prominent speakers have taken part I feel very much like the engineer in the yard with the small compressor. There was also an engine with a large compressor and the yardmaster was after the little fellow to get out of town, and the little fellow said: "How do you expect me to get any air when that big fellow is taking it all."

Chairman:
Mr. McCarthy?

Mr. C. McCarthy:

I do not think I can add anything that would be of interest

to this meeting. There is little chance for criticism, but I would like to endorse what Mr. Langan said about Mr. Farmer being conservative in his statements. I do not think he has told everything, and it is up to the men who hold the positions to get busy now and endeavor to better the conditions. This paper and discussion here to-night will have the effect of stimulating interest in better maintenance of air brakes.

Chairman:

Mr. Hunter?

Mr. W. C. Hunter:

I have nothing to say in criticism of Mr. Farmer's splendid paper. The subject reminds me of a few years ago, when this club was younger, I read a paper also entitled "Maintenance of Freight Car Brakes," and it would seem that during the past years the conditions have not got any better. The case as presented now is pretty nearly as bad as I put it then, but now there is something to bring it more prominently before the railways, and it is to be hoped that the responsible railway officials have learned the lesson, and that the air brake men will get the necessary support so that this season all the brakes may be put in proper condition, so they will not have next winter the trouble they have had this. I cannot speak too strongly in favor of maintenance, and there is one point I wish to emphasize strongly, and that is the proper recording of regular repairs to the brakes. I think there are a number of air brake men in this room who are using a recording system, and who, I think, will agree with me, in fact, I do not see how it is possible that brakes can be properly maintained without a good recording system. Compare the cars with the locomotives. The engineer makes a trip over the road and on arrival at a terminal he makes a report of the work required on the locomotive, and these repairs are made before the engine goes out again, but he knows nothing about the cars, but the train conductor knows, or should know, and can make a report if required. The General Air Brake Inspector should be able to report to his superior officer monthly the condition of approximately all the brakes on the railway, but he can only do this by having a recording system which is partly compiled from conductors' reports. The conductor arriving at a terminal is much in the same relation to the cars that the engineer is to the locomotive. I would like to know what is being done along that line. I have listened, sir, with great interest and pleasure to this paper, and wish to thank you for calling upon me for these remarks.

Chairman:

I think one reason why we hear so much about defects is that we have more inspectors travelling around and have better supervision. Speaking from the Canadian Government point of view, our General Manager never fails to impress upon me the necessity for care in maintenance of air brake equipment. We have a form made out by the conductor which is similar to the form in effect on the C. P. R. The information given on the form is the number of brakes in operation on the train and the number of brakes inoperative. The inspector signs this form and hands it to the conductor, who fills in the the information, showing the trouble experienced with brakes on cars in transit between divisional points, and when he arrives at the end of the division he sends in this report with his time ticket; he also sends copy of report to my office where a record is taken of same and kept for three or four months. We check up the conditions on particular districts and hold them in case trouble may be experienced at any time. Along this line it would be well to hear from Mr. R. A. Pine, Supt. of Motive Power, C. P. Railway.

A Member:

Mr. Pine is not present.

Mr. A. B. Brown:

Mr. President:

On account of the willingness of the members to allow me to discuss air brake matters with them on most any business day in the year, I did not intend to take up the time of the meeting this evening, especially as there are a number of gentlemen here from out of town capable of continuing the discussion in a manner that will prove far more profitable.

We fellows who know Mr. Farmer well, when we learned that he had agreed to come to Montreal for this meeting, expected that there was a treat in store, and I feel sure there is no one here to-night who has been disappointed. Undoubtedly his recommendations will be given the fullest consideration by Canadian roads and followed as far as is practicable.

The value of the brake test to be made by engineers of incoming freight trains, as recommended, certainly cannot be overestimated and must be made use of generally if we expect to get anywhere in the matter of brake maintenance. If we wait until freight yards are piped for compressed air before establishing proper test we will meet with serious handicaps,

as too often the installation of these facilities has been delayed indefinitely, on account of the expense.

I overheard our president say to some of his men on one occasion, the time to inspect the running gear on a car is on its arrival in a yard. The same remarks apply to the brake. It is not the time to inspect and repair brakes when train is ready to leave, and Mr. Farmer's incoming brake test provides the remedy.

Another point. All officials are anxious, as previous speakers have indicated, to get their trains out of terminals with the least possible delay, but it is certainly unfair to the brakes to be switching cars at leaving time, and especially when the incoming brake test has not previously been made. The result of such a practice generally is that the train does not receive attention, and is often handled five or six hundred miles in fast freight service. When these cars are delivered to certain connecting lines they are held up for whatever time is necessary to put the brakes in a reasonable condition, with the result that the train does not get to its destination any earlier than if the work was properly done at the originating point of the delivering line. In this instance the connecting line is the one that benefits from good brake conditions, while if the work had been done at the oirginating point, both lines would have profited and undoubtedly the trip would have been far more satisfactory from every point of view.

I would be neglecting my duty if I did not say that my experience with the majority of Canadian roads is, that they are making an effort to follow the majority of the recommendations made by Mr. Farmer and other speakers. If they failed to do as well recently as some of the American roads, it is because of the unusual conditions resulting from the three years of war.

Mr. Langan referred to several trains that have come to his attention during the past winter where the brakes would not apply, even with an emergency application. That is a serious condition. I assume that Mr. Langan's trouble was probably due to the accumulation of ice in the brake cylinders, and I wonder if this is not the result of brake cylinders being left in an exposed position before being applied to cars. Occasionally you see a large pile of brake cylinders located outside a shop exposed to storms, and it is not difficult to see how water might enter the brake cylinder by the non-pressure head, and if any water remains after cylinder is applied to car it will freeze in low temperature conditions. I would

strongly urge that we provide better facilities for storing our brake cylinders.

We have with us a gentleman who has come from the Lake Superior Division of the Canadian Northern. He says he would like to talk to the men who say you can run 100% air brake trains. Mr. Clegg, to whom I refer, is on the firing line all the time. I think it would be a good thing to have a few words from him.

Chairman:

We shall be glad to hear from Mr. Clegg.

Mr. W. Clegg:

No matter where I go with Mr. Brown I generally get let in for something.

There are one or two questions I would like to ask at this time. One being raised by Mr. Weaver in connection with air hose coupling gauges. I would like to know to what extent these gauges have been used by any of the roads represented by the gentlemen here to-night.

In regard to the matter of cleaning brakes outside in the winter time. As you remarked, Mr. President, it is an awful job, but it evidently has to be done. Would it not be advisable where possible to discontinue such practice during the cold season and increase the output of such work during the warmer weather.

Referring to Mr. Farmer's paper in connection with the maintaining of brake pipes, I may say that quite recently we experienced a delay of 1 hr. and 45 mins. with a double header freight train, caused by pulling out a draw bar 31 cars back from engine on a 70 car train. due to a loose brake pipe swinging around in such a manner that the angle cock handle had belome almost entirely closed, and when the brake application was made resulted in the cars behind the partly closed angle cock failing to release.

In connection with the incoming brake test, it seems to me the most difficult thing to determine is the exact cause of brakes leaking off as it is possible that the leakage may take place either by the brake piston or the check valve in the triple valve when brake pipe pressure becomes depleted by brake pipe leakage. Where terminals are equipped with facilities and staff to check up these defects it is indeed a good practice.

I think this matter of freight brake maintenance is indeed a very live subject particularly at this time, and should receive the most careful attention of both motive power and car men.

as the present conditions of train brakes generally are now a serious matter.

Chairman:

210,000 freight cars in Canada, or, say, 300,000, making a total of 700,000 brakes to clean, or during the summer months, 1,400 to clean per day. Mr. Winterrowd, how are you going to do it?

Mr. W. H. Winterrowd:

I do not think I can add anything to what has been said to-night, other than endorse the statements made. I think it is up to us to get back to our shops and get action. We have been talking about this to-night and the discussion has been stimulating. I think it is now up to us to do something.

Mr. P. J. Langan:

Mr. Brown asked a question about trouble with air brakes by ice forming in brake cylinders. This was during the time of heavy storms throughout the Chicago District. From the way the cars came to us it looked as if the ice was the result of accumulation of snow in the cylinders. It was necessary to have a fire under each cylinder to remove the moisture and then renew the packing leathers. The Lackawanna has paid for its experience, due to wrecks which happened years ago, but since that time have been willing to spend any amount of money to get proper operating conditions, because they have found out that it pays to spend money for maintenance to insure proper service and not endanger lives and property. We are willing to pay anything to maintain safe conditions, for once you have a runaway it takes the nerve out of the men on the road for the next six months and have less efficiency from the men. The conditions last winter were so bad that some of the engineers refused to handle trains on grade. We never censure an engineer under these conditions, because if he went he had to assume the responsibility. It pays to instill in the minds of the men that safety first is what you want above everything else. Our instructions to inspectors are that unless 90% of the brakes are operating efficiently the train is not to be allowed to leave the yard. The inspector is the biggest man on the road if he uses his opportunities, and we defend him every time. We must consider that a train is worth from $150,000 to $250,000, and that the best insurance for safe and proper delivery at the next terminal is good operating air brakes.

Mr. F. B. Farmer:

I wish to thank you all for the large turnout, which is very complimentary, and also the speakers for their kind remarks. My friend, Mr. Langan, says I have not shown conditions as bad as they are, but I can assure you that the figures are accurate. I think we are both right as our conditions, while quite unsatisfactory, were not as bad as in the east, and I can readily understand why Mr. Langan feels that I have not shown things up as bad as they are.

If we are to better the poor freight brake maintenance and thereby meet the war needs we will have to ignore some of the rules and practices that were proper in normal times.

Instead of considering a brake out of order that has run 12 months or more since cleaned, as stipulated by M. C. B. rules, this should now be 9 months, particularly for cars on repair tracks. Another M. C. B. requirement that should now be ignored is requiring that all triple valves cleaned must be tested on the stipulated rack. This is right where such racks are available, but if we are to meet the needs, brakes must also be cleaned and test ed as efficiently as possible at every point where repair tracks have the requisite air pressure. If competent cleaners are not had they should be made. This will not produce the best results, but it will greatly improve present maintenance. If the road referred to in the paper had not followed this practice its brake maintenance would not have been so superior to that of foreign lines.

The foregoing require orders from an authoritative source to so vary from M. B. C. rules, and it is hoped that railway officers concerned will take prompt action to aid in bringing this about for foreign cars. For system cars I believe they should arrange at once.

For cleaning the brakes on rush loads in large yards please consider the Soo Line plan of a few years ago. The Car Department was given a short, convenient track in the yard. A convenient box contained the needed good-order air brake parts. The brakes were tested on each incoming transfer, and rush loads with defective brakes were switched promptly to this track. Two assigned cleaners would have such cars ready without delaying transit.

While agreeing with the speakers who said we must not let trains go until brakes are in condition to control the trains safely, the freight must be moved and we should find ways to maintain brakes with the least delay. Mr. Winterrowd emphasizes a big factor toward this end by his statement that work worth doing is worth doing well.

Referring to Mr. Weaver's remarks about burst hose, it may interest you to know that on a western road, having a tunnel in which burst hose would be dangerous, they test the hose of all freight trains at the terminals in advance of the tunnel. With brakes charged to 90 lbs., soap-suds is applied and all porous hose are replaced. One of these terminals has had to replace as many as 2,500 hose in a month.

Mr. Clegg asks about the desirability of cleaning brakes in the winter. Even where temperatures are low, some must be cleaned, but the less the better, as it is expensive and inefficient. We must do more before winter. I know a road with 27 cleaning points. By cleaning, on an average, two more brakes per day at each point this would add 1,300 per month, certainly practicable and worth while.

I think you will agree that if everyone will make a little improvement at each cleaning point it will go far toward meeting the needs. As Mr. Weaver said, we do not want to go through next winter with what we have gone through this winter. There will continue to be difficulty in keeping competent cleaners, and we must meet this by more instructing and supervision.

Mr. E. J. McVeigh:

I consider we have had a great treat to-night and have gained considerable knowledge. We have had a number of hints as to what we should do in the future, but it is very little this club can do except to show its appreciation of Mr. Farmers's action in coming so far to give us this paper. We can at least give a vote of thanks, not only to Mr. Farmer but to the other gentlemen who have taken part in this excellent discussion.

Seconded by Mr. Brown.

Chairman:

Moved by Mr. McVeigh, seconded by Mr. Brown, that a hearty vote of thanks be tendered to Mr. Farmer for the paper to-night, and to our friends and members for the interesting discussion which followed. It has been one of the best papers we have had during the year. I will ask the members to rise and give Mr. Farmer a standing vote of thanks.

Mr. F. B. Farmer:

I thank you for your kind remarks and will ask your indulgence for a moment longer. We have had considerable discussion to-night on this paper, but there is so much of it

that it requires a little thought, and I wish personally that any who have the time to go over it, if they have any suggestions to offer will kindly send them to me I will give them careful consideration, as we want to be able to put the paper in such shape that it can be printed and distributed as Westing house literature, so that it may be of use in assisting the foremen.

Chairman:

As you probably know, this is the last paper of the year, and it is customary at this meeting to appoint a Nominating Committee for the election of new officers. The Executive Committee has appointed a member from each railway and one of our good friends, the railway supply men. I will appoint to this committee:

C. P. R., Mr. J. A. Shaw; G. T. R., Mr. G. M. Wilson; Can. Northern, Mr. C. G. Mitchell; Can. Gov., Mr. I. B. Shortley, and Railway Supply Men, Mr. F. A. Purdy.

At our next meeting the Election of Officers for the ensuing year will take place, after which we will hold a smoker. In this connection it is necessary to have an Entertainment Committee. I will appoint Messrs. N. Holland, E. Smith, E. A. Nix and Jas. Powell. Coffee and sandwiches are being served in the room at the rear. It will now be in order to adjourn.

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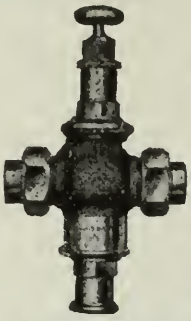

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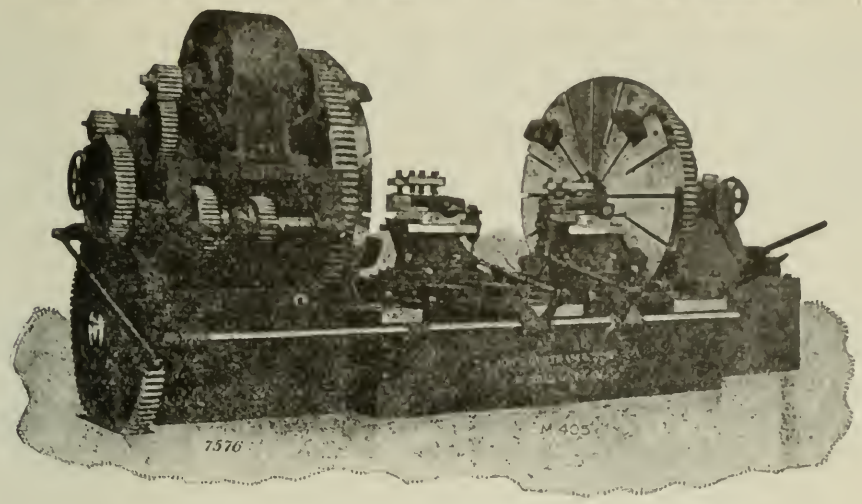

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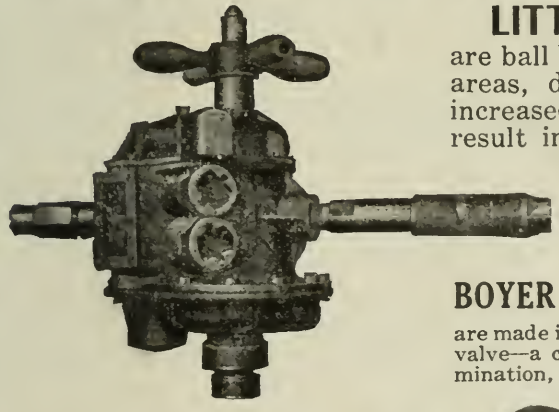

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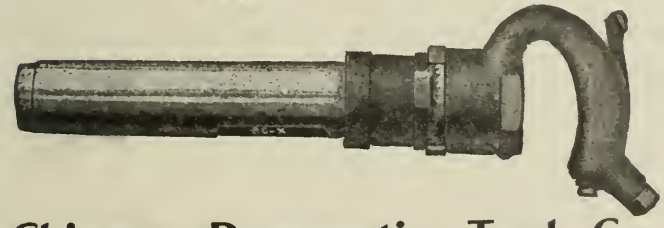

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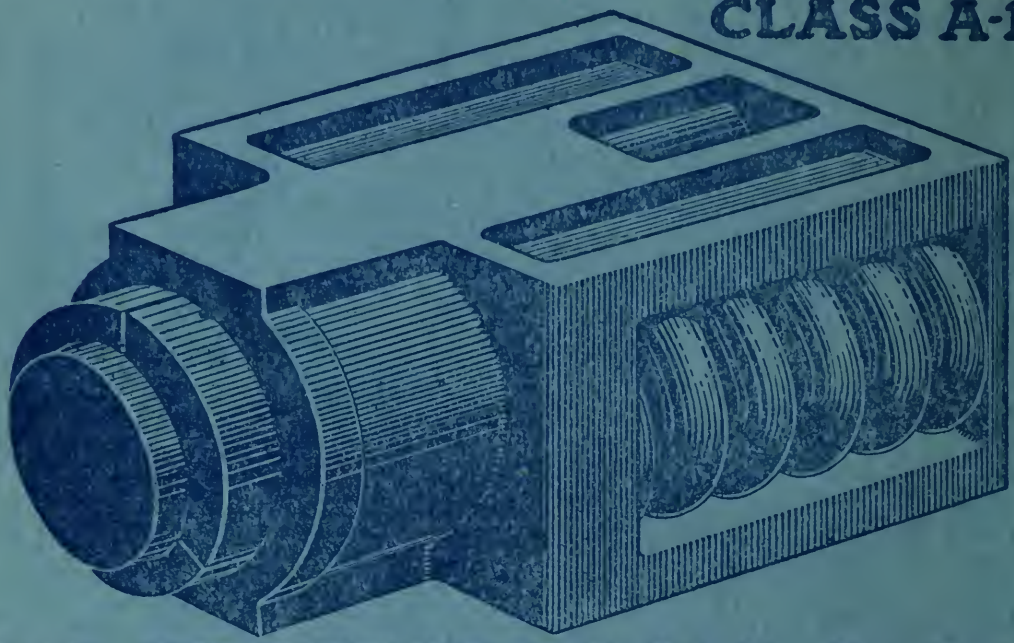

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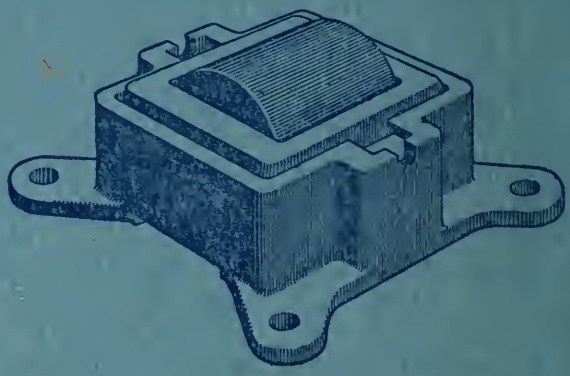

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